

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

May-June 2025

(B. Tech) Program: Computer Engineering Scheme III

Supplementary Regular Examination: SY Semester: IV

Course Code: CEC404 and Course Name: Theory of Computer Science

Date of Exam: ~~26/05/2025~~

Duration: 02.5 Hours

Max. Marks: 60

04/08/2025

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any two questions out of three: (05 marks each)	10		
a)	Design turing machine to perform 2's complement of a binary number		CO5	Ap
b)	Design NFA for the regular expression (R.E), $r=10+(0+10)^*1$		CO1	Ap
c)	Design RE for the following i. Set of all string over $\Sigma = \{0,1\}$ that end with 1 and has no substring 00 ii. Set of all strings over $\Sigma = \{0,1\}$ with even number of 1's followed by odd number of 0's.		CO2	Ap
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Write a short note on "Halting Problem"		CO6	U
b)	Convert the following grammars to the Chomsky Normal Form(CNF) $S \rightarrow 0A0 \mid 1B1 \mid BB, A \rightarrow C, B \rightarrow S \mid A, C \rightarrow S \mid \epsilon$		CO3	Ap
c)	Design Turing machine that accepts the string over $\Sigma = \{0,1\}$ and converts every occurrence of 111 to 101.		CO5	Ap
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	Design PDA to accept language $\{a^{n-1}b^{2n+1} \mid n \geq 1\}$		CO4	Ap
b)	Construct the right linear grammar (RLG) corresponding to the following regular expression(RE): $R=(1+(01)^*)1^*(0+1)$		CO3	Ap
c)	Design the DFA to accept all the binary strings over $\Sigma=\{0,1\}$ that are beginning with 1 and having its decimal value multiple of 5.		CO 1	Ap
Q.4	Solve any two questions out of three. (10 marks each)	20		

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a)	Compare and Contrast Moore and Mealy machine. Construct Moore machine to find out the residue-modulo-3 for binary numbers.	CO1	Ap
b)	Design a Turing machine that computes a function $f(m,n)=m+n$ i.e addition of two integers	CO5	Ap
c)	i. Explain decision properties of regular languages. (5M) ii. Explain pumping lemma of a regular language with as example (5M)	CO2	U

Seat No.: